STUDY OF SEISMIC PROPAGATION PATHS AND REGIONAL TRAVELTIMES IN THE CONTINENTAL UNITED STATES

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U. S. Geological Survey, Denver, Colorado

Technical status--R. D. Borcherdt and J. C. Roller report that a seismic-refraction survey made by the Geological Survey in the vicinity of the Cumberland Plateau Seismic Observatory, Tennessee, in June and July 1965, indicates the velocity of seismic waves in the upper crustal layer (P_g) is 6.1 km/sec, in the intermediate layer (P*) is 6.7 km/sec, and in the upper mantle is 8.0 km/sec or slightly higher. Their interpretation shows that the depth to the intermediate layer varies from 6.3 km to 14.5 km, and that the M discontinuity dips generally toward the south from a depth of 35 km near Fort Campbell and Burnside, Kentucky, to a depth of 45 km near Gainsville, Georgia, and Moulton, Alabama. The preferred crustal model at the Cumberland Plateau Seismic Observatory is: H_1 = 12 km, (V_1 = 6.1 km/sec) H_2 = 28 km (V_2 = 6.7 km/sec) for a total crustal thickness of 40 km, and an upper-mantle velocity of 8.0+ km/sec.

L. C. Pakiser and Rhoda Robinson have prepared a new estimate of the abundances of the major elements in the continental crust of the United States. The method used was to estimate the volume

of silicic and mafic crustal rocks in the various provinces and groups of provinces from seismic-refraction results of the Geological Survey and other groups and, using the average compositions of granodiorites and mafic igneous rocks as presented by Nockolds in 1954, to compute the percent by weight of each of the major oxides in the crust within and west of the Rocky Mountains, east of the Rocky Mountains, and in the whole continental crust of the United States. Percents by weight of mafic rocks in the crust were estimated as follows: west, 45.3; east, 59.2; continent, 55.4. Percents by weight of the major oxides for the whole continental crust were estimated as follows: SiO_2, 56.9; Al_2O_3, 15.7; Fe_2O_3, 2.1; FeO, 5.7; MgO, 5.5; CaO, 7.6; Na_2O, 3.0; and K_2O, 1.8. These results are considerably more mafic than those previously reported, but nearest to those reported by Poldervaart in 1955. The average thickness of the crust in and west of the Rocky Mountains is 34 km, of which silicic rocks have an average thickness of 19 km and mafic rocks have an average thickness of 15 km. The average thickness of the crust east of the Rocky Mountains is 44 km, of which silicic rocks have an average thickness of 19 km (the same as in the west) and mafic rocks have an average thickness of 25 km, or 10 km more than in the west. The addition of a larger amount of mafic material from the mantle in the east seems to explain the main difference between the crust of the east and the crust of the west.

A seismic-noise study made by R. E. Warrick on twenty recording sites occupied during a long-range seismic-refraction program in Norway indicates no obvious correlation of noise levels with major geologic provinces. Sites near the western coast of Norway generally had higher seismic-noise levels than those located in the interior of the country.